

One new species of the genus *Homidia* (Collembola: Entomobryidae) from Zhejiang Province, with a description of the second instar larvae

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Abstract: A new species, *Homidia xianjuensis* sp. nov. from eastern China, was described. It can be identified by head dark including ventral side, except “Y”-shape unpigmented patch on dorsal central head, one interrupted stripe on each sub-lateral thorax to abdominal segment I, chaetotaxy of labium and abdominal segment I and IV–V. Illustrations of the second instar larvae of this new species were also provided.

Key words: springtail; Entomobryinae; chaetotaxy; juvenile; taxonomy

浙江省刺齿姚属一新种及其二龄幼体描述（弹尾纲：长角姚科）

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摘要: 记述中国东部弹尾纲 1 新种: 仙居刺齿姚 *Homidia xianjuensis* sp. nov., 本新种的鉴定特征为头部黑色, 仅头背部眼后有 1 “Y” 形无色斑, 胸节到腹部第 1 节背亚两侧各有 1 条不连续纵纹, 以及下唇及腹部第 I 节和第 IV–V 节的毛序; 文中还给出了该新种的二龄幼体特征图。

关键词: 姚虫; 长角姚亚科; 毛序; 幼虫; 分类

Introduction

The genus *Homidia* was established by Börner (1909). After a century of development, 66 species have been reported worldwide (Bellinger *et al.* 1996–2016), with 12 of them recorded from Zhejiang Province in eastern China (Pan 2015). Colour pattern, chaetotaxy of labium, Abd. I, Abd. IV and Abd. V, relative position of the specialised chaetae (S-chaetae) on lateral Abd. I and middle ordinary S-chaeta to chaetae m3 on Abd. V were highlighted for taxonomy of this genus at the species level (Pan *et al.* 2010, 2011a, b; Pan & Shi 2012, 2015). A new species with a distinctive colour pattern was described from Zhejiang Province. Chaetotaxy of the second instar larvae was also illustrated here.

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Material and methods

Specimens were extracted using Tullgren funnels and stored in 99% ethanol at -20°. Photographs were imaged with a Nikon DS-Fi1 camera on a Nikon SMZ1000 stereomicroscope before clearing. Multiple-focus images were combined by Helicon Focus 6 (Helicon soft) and labels were added with Photoshop CS2 (Abode Systems). Specimens were cleared in Nesbitt's fluid, mounted under a coverslip in Hoyer's medium (Krantz 1978), and examined with a Nikon 80i phase-contrast microscope. Lengths were measured employing NIS-Elements Documentation 3.1 software (Nikon). Szeptycki's (1973) terminology was used for nomenclature of dorsal cephalic chaetotaxy, labrum and basal denes, while nomenclature of labial palp chaetae followed Fjellberg (1998), labial chaetae after Gisin (1967), and dorsal tergal chaetotaxy after Szeptycki (1979). Dorsal chaetotaxy are illustrated for one side of body only.

Abbreviations: Ant.—antennal segment; Th.—thoracic segment; Abd.—abdominal segment; ms—specialised microchaeta(e); sens—specialised ordinary chaeta(e); mac—macrochaeta(e); mic—microchaeta(e); Gr.—Group.

Taxonomy

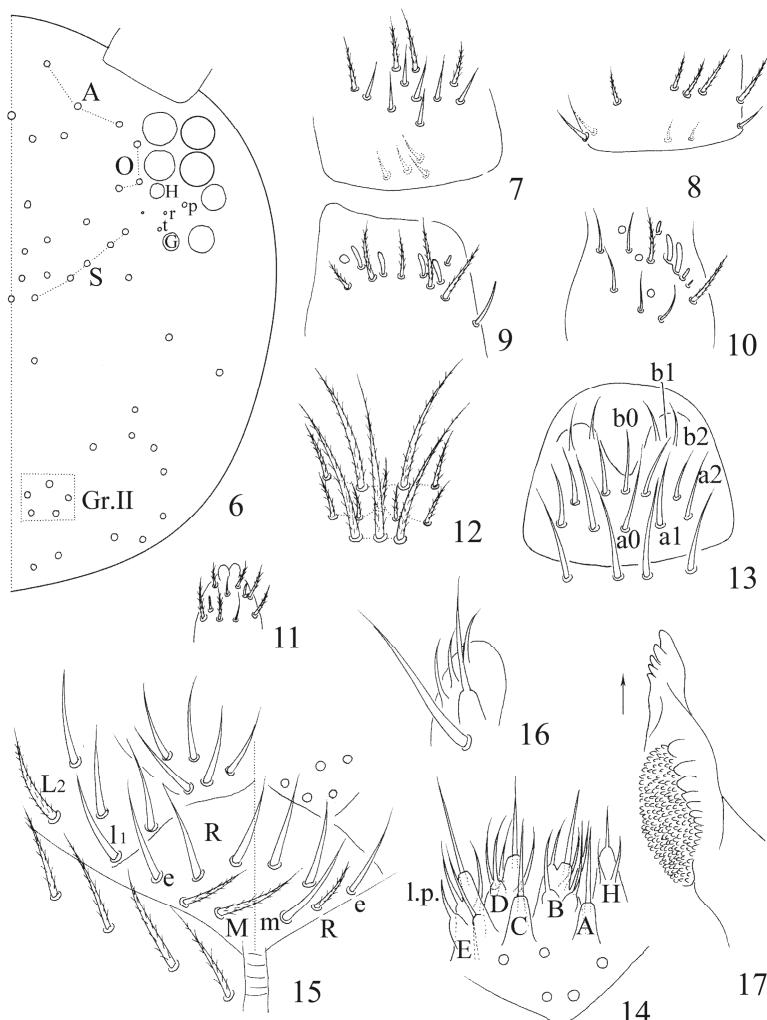
Homidia xianjuensis sp. nov. (Figs. 1–40)

Adult. Body length up to 3.04 mm.

Ground colour pale yellow in ethanol except furcula in pale white. Whole head including ventral side dark, except "Y"-shape unpigmented patch central and posterior to eye patches. Ant. I–II unpigmented, III–IV dark. Th. II–Abd. I with one interrupted stripe on each sublateral, with one quadrate patch on central Th. III and a narrow band on Abd. I between them. Abd. II–III completely dark except connecting between them. Abd. IV with middle and posterior two bands. Abd. V completely dark. Coxae of leg I–III and femur of leg III dark. Trochanter of leg III slightly pigmented. Ventral side of trunk unpigmented except ventral tube (Figs. 1–3). Pattern of subadult congruent with adult and the central patches on Th. III and Abd. I very weak (Fig. 4).



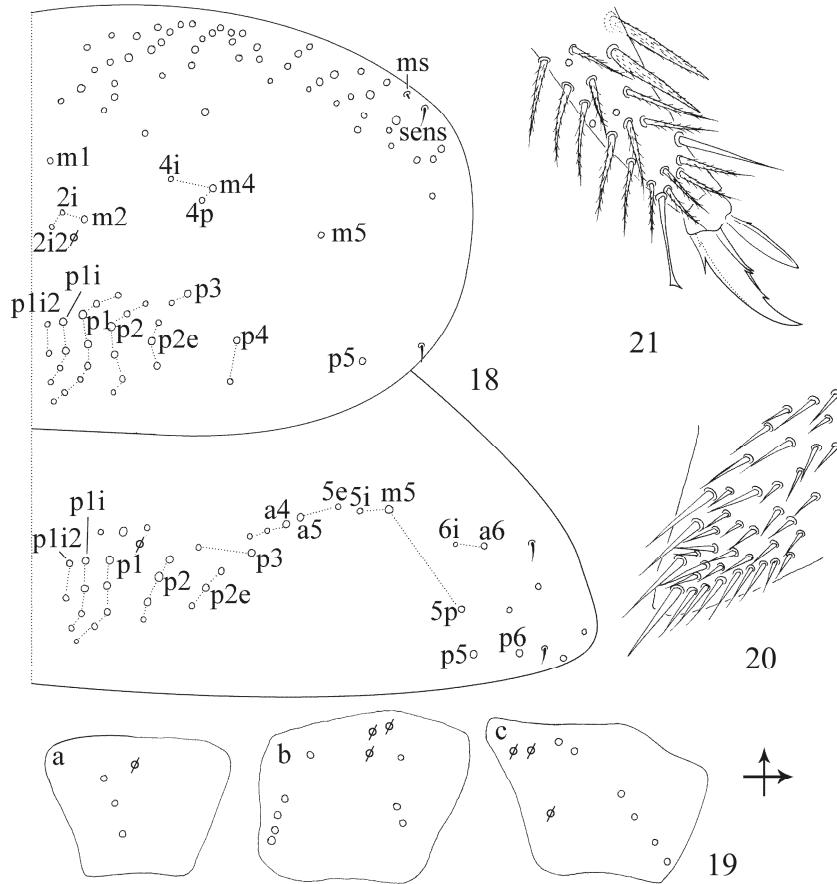
Figures 1–5. Habitus of *H. xianjuensis* sp. nov. 1. Adult, dorsal view; 2. Adult, lateral view; 3. Adult, ventral view; 4. Subadult, dorsal view; 5. 2nd instar larvae, dorsal view.



Figures 6–17. *Homidia xianjuensis* sp. nov. Adult. 6. Cephalic chaetotaxy; 7. Basal Ant. I; 8. Basal Ant. II; 9. Distal Ant. II; 10. Ant. III organ; 11. Distal Ant. IV; 12. Clypeal chaetotaxy; 13. Prelabral and labral chaetae; 14. Labial papillae; 15. Labial and post-labial chaetae; 16. Maxillary outer lobe; 17. Right mandible. 6–8, 11–13, 17. dorsal views; 9, 14, 15. ventral views; 10, 16. lateral views.

Eyes 8+8, G and H smaller than others and difficult to observe under light microscope; eye patch with 3 chaetae, p largest (Fig. 6). Antennal length 1.55–2.11 times the cephalic diagonal; antennal segments ratio as I : II : III : IV = 1 : 1.22–1.61 : 1.02–1.48 : 2.03–2.60. Ant. I with 4 ventral basal smooth mic, dorsal with 5–8 basal mic but hard to identify smooth or ciliate under light microscope (Fig. 7); Ant. II with 5 basal smooth mic with ventral 2 shorter (Fig. 8), and distal with 5–6 (4–5 longer and 1 shorter) rod-like S-chaetae on ventral side (Fig. 9). Ant. III organ with 2 rod-like and 3 short guard S-chaetae (Fig. 10). Apical bulb of Ant. IV bilobed (Fig. 11). Dorsal cephalic chaetotaxy with 3 antennal (A), 3 ocellar (O) and 5 sutural (S) mac, Gr. II with 5 mac (Fig. 6). Clypeus with 12 ciliate chaetae arranged in 3 rows, 3, 5, 4 from posterior to anterior, respectively, chaetae in middle row and lateral 2 of anterior row shorter (Fig. 12). Prelabral and labral chaetae as 4/5, 5, 4, all smooth; labral papillae absent,

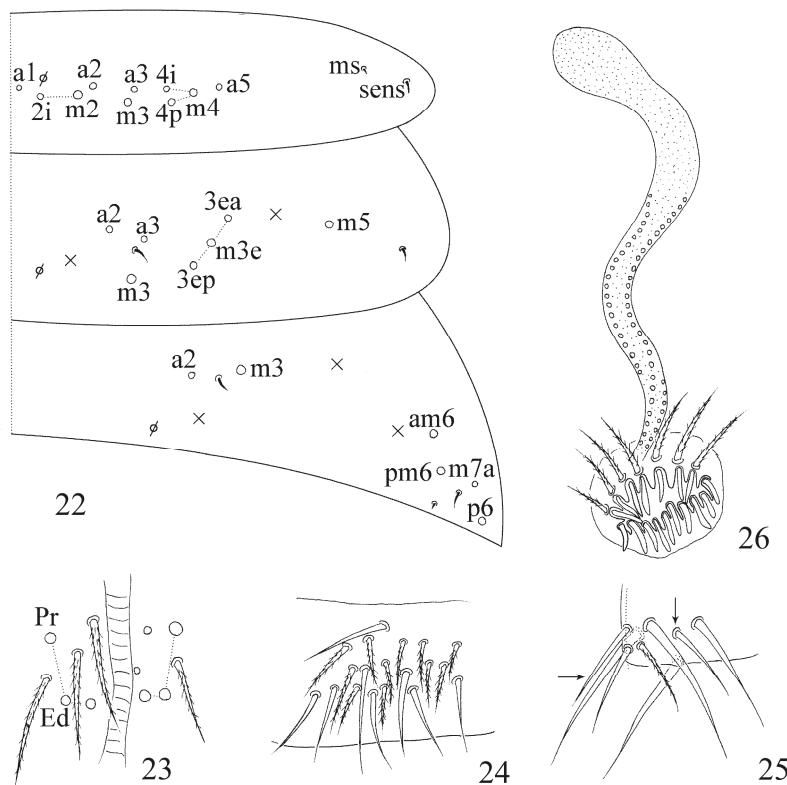
intrusion U-shaped; one individual with b0, b1 and b2 distinct shorter than others (Fig. 13). Five papillae A–E on labial palp with 0, 5, 0, 4, 4 guard chaetae, respectively. Lateral process (l.p.) thin with tip reaching apex of papilla E (Fig. 14). Chaetal formula of labial base as MRel₁L₂, e and l₁ smooth and others ciliate, R/M as 2/3; one individual with m as smooth chaeta on one side (Fig. 15); posterior labial chaetae not expanded. Maxillary outer lobe with 1 apical, 1 subapical chaetae and 3 sublobal hairs on sublobal plate, subapical chaeta longer than apical one (Fig. 16). Mandible with distal teeth and basal molar teeth plate, 5 distal teeth in right (Fig. 17) and 4 in left.



Figures 18–21. *Homidia xianjuensis* sp. nov. Adult. 18. Dorsal chaetotaxy of Th. II–III; 19. Coxal macrochaetal formula (a. Fore leg; b. Mid leg; c. Hind leg); 20. Trochanteral organ; 21. Distal tibiotarsus and claw of left hind leg, posterior view.

Complete body sens as 22/122 (about 40)3, ms as 10/10100. Th. II with 4 (m1, m2, m2i and m2i2) medio-medial, 3 (m4, m4i and m4p) medio-sublateral and 3 S-chaetae (ms antero-internal to sens); posterior with 28–31 mac; p4, p4i and p5 as mac, p6 as mic. Th. III with 35–39 mac and 2 sens; p5 and p6 as mac, p4 as mic (Fig. 18). Coxal macrochaetal and pseudopores formula as 3 (1 pseudopore)/4+1, 3 (3 pseudopores)/4+2 (3 pseudopores; according to one individual) (Figs. 19a–c). Trochanteral organ with 34–40 smooth chaetae; posterior 3–4 longer (Fig. 20). Inner tibiotarsus with 2–3 lines weakly ciliated chaetae. Tenent

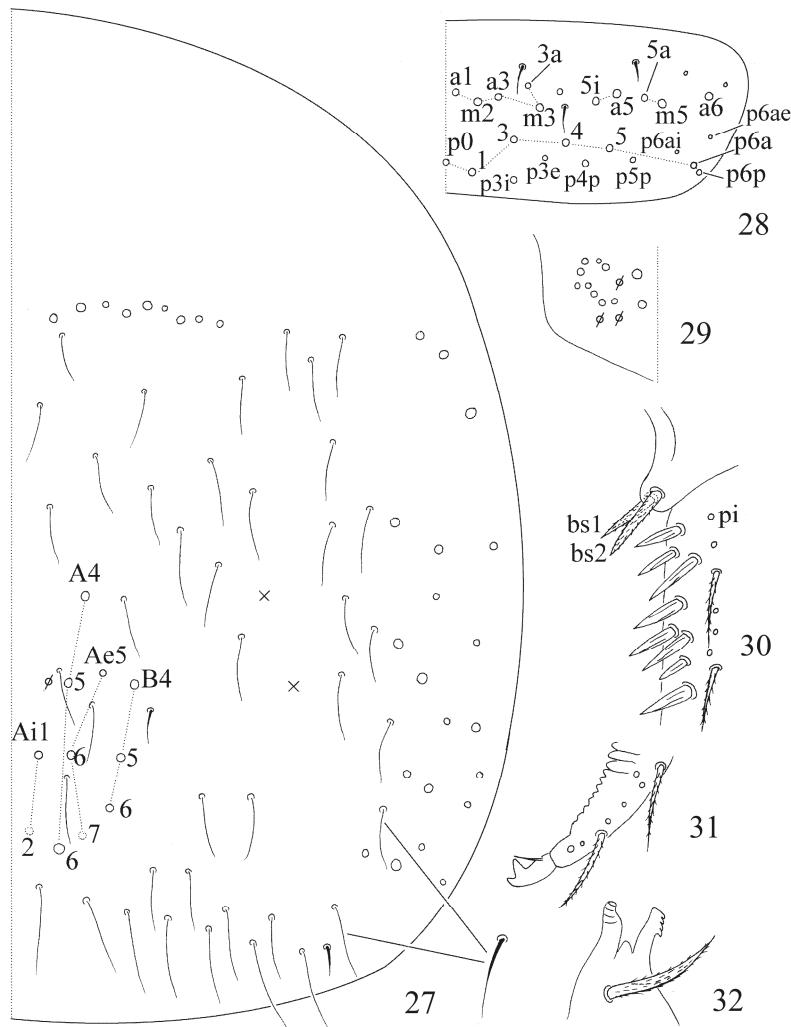
hair capitate, subequal to inner edge of unguis. Unguis with 3 inner, 2 lateral and 1 outer teeth, lateral 2 largest. Unguiculus lanceolate with one basal outer tiny tooth (Fig. 21).



Figures 22–26. *Homidia xianjuensis* sp. nov. Adult. 22. Dorsal chaetotaxy of Abd. I–III; 23. Anterior face of ventral tube; 24. Lateral flap of ventral tube; 25. Posterior face of ventral tube; 26. Male genital plate and spermaduct, ventral view.

Abd. IV length 7.2–11.6 times Abd. III along longitudinal axis. Abd. I with 10 (a1–3, a5, m2–4, m2i, m4i and m4p) mac and 2 S-chaetae (ms antero-internal to sens). Abd. II with 6 (a2, a3, m3, m3e, m3ea and m3ep) central and 1 (m5) lateral mac. Abd. III with 2 (a2 and m3) central and 4 (am6, pm6, p6 and m7a) lateral mac (Fig. 22). Abd. IV with about 38 elongate and 2 normal sens and 9–11 postero-central mac (A4–6, Ae5, Ae6, Ai1, B4–6; Ae7 and Ai2 sometimes present, chaetae in Ae and Ai series sometimes only present in one side) (Fig. 27). Abd. V with 3 sens, middle one external to m3; a1, m3a, a5i and m5a as mac (Fig. 28). Ventral tube with 3+3 mac on anterior face, line connecting proximal (Pr) and external-distal (Ed) mac subparallel to median furrow (Fig. 23); lateral flap with 7–8 smooth and 9–11 ciliate chaetae (Fig. 24); posterior face with 5 or 7 (2|1|2 or 3|1|3) subapical smooth chaetae, middle one shorter, arrow indicating chaetae sometimes are absent (Fig. 25). Manubrial plaque with 3 pseudopores and 9–12 ciliate chaetae (Fig. 29). Dens with about 38 inner spines; basal chaetae (bs1 and bs2) spiniform, bs1 shorter than bs2; morphology of chaeta pi unclear (Fig. 30). Mucro bidentate with subapical tooth larger than apical one; basal spine short, with tip reaching just beyond subapical tooth; distal smooth part of dens shorter than mucro in length

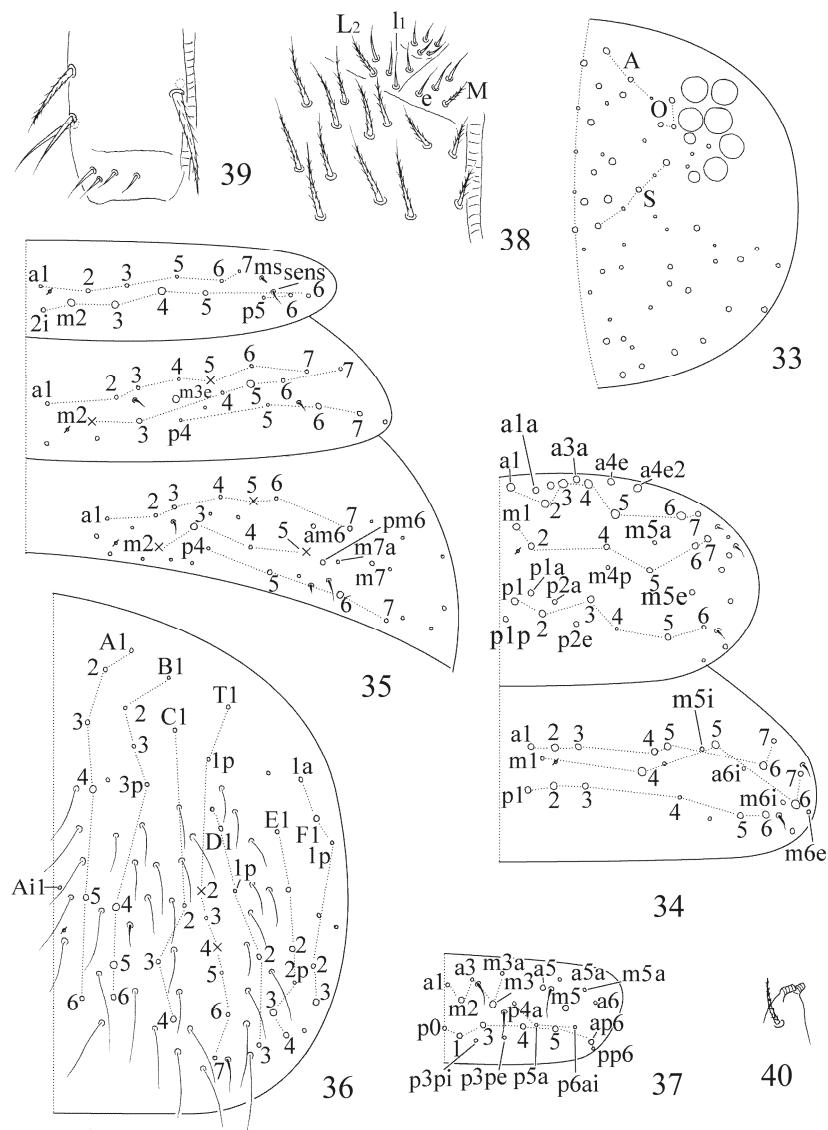
(Fig. 31). Tenaculum with 4+4 teeth and 1 large, basal, multilaterally ciliate chaeta (Fig. 32). Male genital plate and spermiduct showed in Fig. 26, with 17 lobe-like chaetae on inner and surrounded by ciliate chaetae.



Figures 27–32. *Homidia xianjuensis* sp. nov. Adult. 27. Dorsal chaetotaxy of Abd. IV; 28. Dorsal chaetotaxy of Abd. V; 29. Manubrial plaque, dorsal view; 30. Basal dens, dorsal view; 31. Distal dens and mucro, lateral view; 32. Tenaculum.

Second instar larvae. The second instar larvae with congruent colour pattern to adult, however, the ground colour pale white and pigment on dorsal body slighter (Fig. 5). Dorsal mac chaetotaxy given in Figs. 33–37. Chaeta R(r) on labium absent (Fig. 38). Ventral tube with 1+1 ciliate chaetae on anterior face, 2 smooth chaetae on lateral flap and 2 subdistal smooth and 1 ciliate chaetae on posterior face (Fig. 39). Tenaculum with basal ciliate chaeta present (Fig. 40).

Ecology. Found under the artificial stacked leaf litter of *Ficus erecta* Thunb. and *Quercus glandulifera* Nakai.



Figures 33–40. *Homidia xianjuensis* sp. nov., 2nd instar larvae. 33. Cephalic chaetotaxy; 34. Chaetotaxy of Th. II–III; 35. Chaetotaxy of Abd. I–III; 36. Chaetotaxy of Abd. IV; 37. Chaetotaxy of Abd. V; 38. Labium and posterior labium; 39. Ventral tube; 40. Tenaculum. 33–37. dorsal views; 38. ventral view; 39. lateral view; 40. posterior view.

Holotype. ♀ on slide, **China**, Zhejiang, Taizhou City, Xianju County, Danzhu National Forest Park, 28°35'54.92"N, 120°31'4.79"E, altitude 598±10 m, sample number 4500, collected by Zhixiang PAN, 18-X-2015. **Paratypes.** 1♀2♂ adult and 1 juvenile (2nd instar) on slides and 3 in ethanol, same data as holotype. All types are deposited in the School of Life Sciences, Taizhou University.

Etymology. Specific epithet named after the type locality.

Remark. This new species is characterized by dark head with "Y"-shape unpigmented

patch posterior to eye patches, one sub-lateral stripe on each side of Th. II–Abd. I, 9–11 mac on posterior central Abd. IV, l_1 smooth on labial base, ms antero-internal to sens on Abd. I and middle sens external to m3 on Abd. V.

It is most similar to *Homidia nigrocephala* Uchida, 1943 in ground colour, dark head, dark bands on Th. III–Abd. V, pigment on coxa, trochanter and ventral tube, 3 inner and 2 lateral teeth on unguis. However, it can be discriminated from latter by “Y”-shape unpigmented patch on dorsal head (absent on the latter), Ant. IV whole dark (without pigment on the latter), posterior marginal pigment of Th. III absent (present on the latter) and smooth part of distal dens shorter than mucro (subequal in the latter).

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